Our Ref.: JJVC-141-PCT-US

PCT/JP2005/000914

1. English translation of Amendment under PCT Article 19
2. English translation of Brief Statement under PCT Article 19

CLAIMS OF AMENDMENT

[Received by International Office on July 8, 2005: original claims 1 to 4 and 6 to 13 were amended; original claim 5 was withdrawn; no change in the other claims. (Three pages)]

1. (Amended) An optical device for an optical pickup apparatus for recording or reproducing information with respect to an information recording medium, comprising:

a substrate;

a hologram element to diffract incident beams of first and second wavelengths that are different from each other;

a light receiving element arranged on the substrate and having a first light receiving region to receive an incident beam of the first wavelength diffracted by the hologram element and a second light receiving region to receive an incident beam of the second wavelength diffracted by the hologram element; and

an operation unit to find a difference between a signal from one of the first and second light receiving regions that receives an incident beam of one of the first and second wavelengths made incident to and diffracted by the hologram element and a signal from the other of the first and second light receiving regions that does not receive the incident beam of the one wavelength made incident to and diffracted by the hologram element and receives unnecessary light scattering over the substrate including the first and second light receiving regions, and based on the found difference, remove a signal component representative of the unnecessary light from the signal from the one light receiving region.

2. (Amended) The optical device as set forth in claim 1, wherein

the first light receiving region and second light receiving region have a nearly equal light receiving area.

3. (Amended) The optical device as set forth in claim 1, wherein

if the one wavelength is the first wavelength, the operation unit carries out an operation of (S1 - S2) to subtract the signal S2 of the second light receiving region from the signal S1 of the first light receiving region, and if the one wavelength is the second

wavelength, carries out an operation of (S2 - S1) to subtract the signal S1 of the first light receiving region from the signal S2 of the second light receiving region.

4. (Amended) The optical device as set forth in claim 1, comprising:

determination means for determining whether the wavelength of the incident beam is the first wavelength or the second wavelength; and

polarity switching means for inverting the polarity of an output signal from the operation means between a first polarity and a second polarity according to a result of determination made by the determination means,

when the determination means determines that the incident beam is of the first wavelength, the polarity switching means switching the polarity of the output signal of the operation unit to the first polarity to provide an operation result of (S1 - S2) from the signal S1 of the first light receiving region and the signal S2 of the second light receiving region,

when the determination means determines that the incident beam is of the second wavelength, the polarity switching means switching the polarity of the output signal of the operation unit to the second polarity to provide an operation result of (-1) x (S1 - S2) from the signal S1 of the first light receiving region and the signal S2 of the second light receiving region.

5. (Caceled)

6. (Amended) The optical device as set forth in claim 1, wherein

the incident beams of the first and second wavelengths that are different from each other are main beams emitted toward the information recording medium to detect information from the information recording medium and reflected by the information recording medium; and

the operation unit removes the signal component representative of the unnecessary light from the signal of the one light receiving region that receives the reflected main beam diffracted by the hologram element.

7. (Amended) The optical device as set forth in claim 1, wherein

the incident beams of the first and second wavelengths that are different from each

other are sub-beams emitted toward the information recording medium to carry out a tracking operation of a track on the information recording medium and reflected by the information recording medium; and

the operation unit removes the signal component representative of the unnecessary light from the signal of the one light receiving region that receives the reflected sub-beam diffracted by the hologram element.

8. (Amended) The optical device as set forth in claim 1, wherein

the hologram element is divided into first and second regions having different diffraction axes; and

each of the first and second light receiving regions has a light receiving region to receive a diffracted beam from the first region of the hologram element and a light receiving region to receive a diffracted beam from the second region of the hologram element.

9. (Amended) The optical device as set forth in claim 1, wherein

the first wavelength is in a 650-nm band and the second wavelength is in a 780-nm band.

10. (Amended) The optical device as set forth in claim 1, wherein

at least one of a first light source for emitting light of the first wavelength and a second light source for emitting light of the second wavelength is arranged on the substrate.

11. (Amended) An optical pickup apparatus comprising:

the optical device as set forth in claim 9;

a first light source for emitting light of the first wavelength; and

a second light source for emitting light of the second wavelength.

12. (Amended) The optical pickup apparatus as set forth in claim 11, comprising:

a first diffraction grating to divide light of the first wavelength from the first light

source into a main beam and two sub-beams; and

a second diffraction grating arranged in the optical device, to divide light of the second wavelength from the second light source into a main beam and two sub-beams.

13. (Amended) The optical pickup apparatus of claim 11, comprising:

a first diffraction grating arranged in the optical device, to divide light of the first wavelength from the first light source into a main beam and two sub-beams; and

a second diffraction grating to divide light of the second wavelength from the second light source into a main beam and two sub-beams.

Description based on Article 19 (1)

The point of the present invention is, as explained in page 21 of Description, to remove a signal component representative of unnecessary light. The unnecessary light is caused by a flare produced at an object lens or by reflection from a non-objective recording layer of a dual-recording-layer optical disk and spreads over a substrate on which a light receiving element is arranged.

The principle how to remove the signal component representative of unnecessary light is explicitly explained in Description with reference to Figs. 10 to 13.

More precisely, there is arranged the operation unit. When a beam having one of first and second wavelengths is made incident to the hologram element, one of the first and second light receiving regions receives the incident beam diffracted by the hologram element and provides a first output signal. At this time, the other of the first and second light receiving regions does not receive the diffracted incident beam, receives unnecessary light scattering over the substrate including the first and second light receiving regions, and provides a second output signal. The operation unit finds a difference between the first and second output signals and removes an unnecessary light component contained in the first output signal.

On the other hand, the noise removing technique described in Document 2 employs, as stipulated in Paragraph 0053, an output from a photodiode to which no reflected light is made incident, to remove noise caused by a variation in a constant voltage source, noise from a high-frequency superposing circuit and digital circuit, and noise generated by the photodiode itself. Paragraphs 0057 and 0083 stipulate that reflected light without noise is obtained from an optical disk.

Document 2, however, stipulates nothing about a noise component caused by unnecessary light spreading over a light receiving element substrate, the unnecessary light being caused by a flare produced at an object lens or by reflection from a non-objective recording layer of a dual-recording-layer optical disk. Namely, Document 2 contains no technical idea of removing a noise component caused by unnecessary light spreading over a substrate on which a light receiving element is formed.

Consequently, Claims 1 to 13 have novelty and inventive steps.